Future Tracking Code Base

Now is the time to move past long-standing limitations.

Capabilities We Will Need / Long Term Goals:

(1) Tracking with Realistic Geometries

(2) Multiple Collision Vertexing & Evaluation

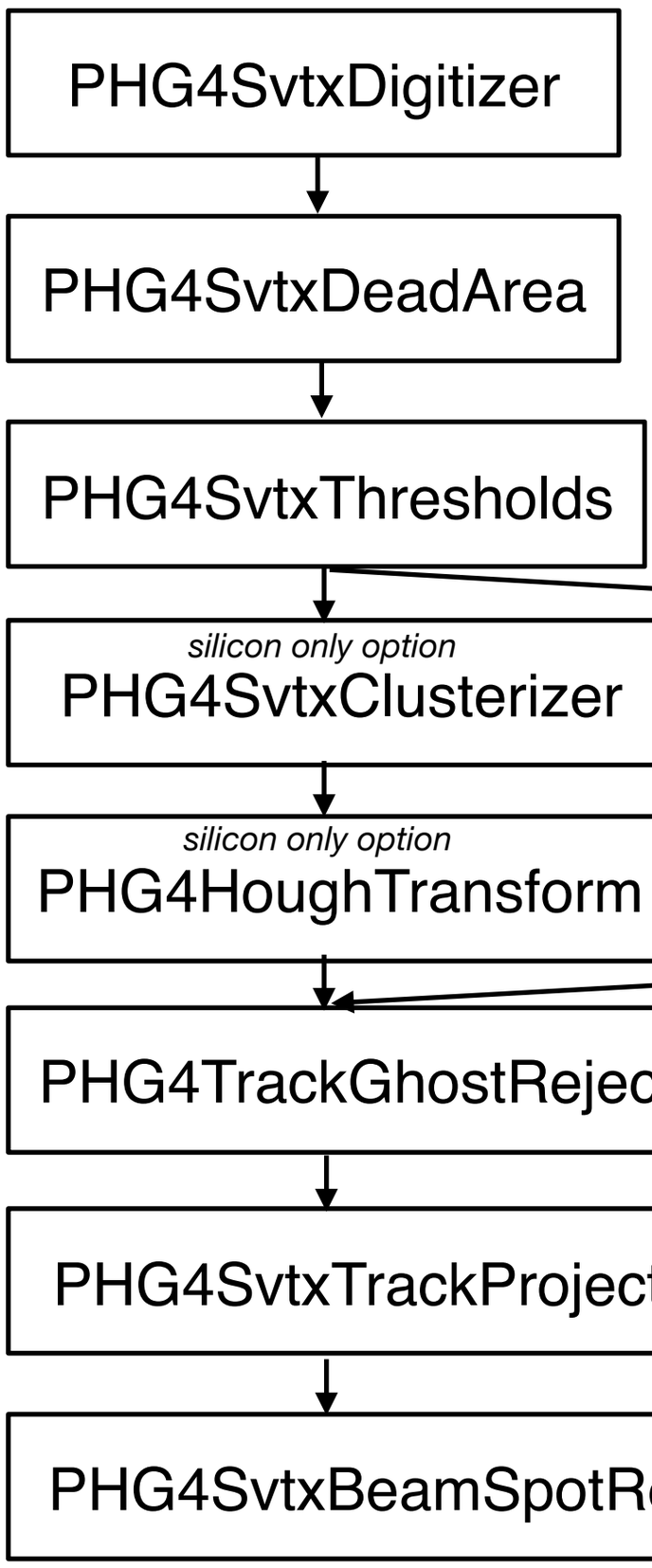
(3) Advanced Track Projections

(4) Primary Vertex Tracking

(5) Pileup Simulations

(6) Modularize and Maintain the Core Tracking Implementations

Current Tracking Code Base



cell => SvtxHit creation, ADC digitization of energy

random deletion of SvtxHits based on input dead area

removal of low energy hits

SvtxCluster creation, opt. energy thresholds

SvtxTrack creation, track finding & fitting, vertexing

overlap testing, keeps best chisq track

fills calorimeter matching fields on SvtxTrack

updates

Geometry Effort

(1) Tracking with Realistic Geometries

(I) Full Material Descriptions

- MAPS ladder design
- TPC field cage / end-caps
- Strip ladder design (consider UV capability)

(II) Handling for New Geometries

- Update switch for Cylinder / Ladder geometries to handle new ladders

(III) Full Geo/Field Kalman Fits

- Use **GenFit interface** as Stand-Alone Track Refitter

(IV) Updated Ghost rejection with Merge & Refit Capability

- Handle overlapping layers
- Use **GenFit interface** to refit tracks after merging

(V) Replace Simplified Kalman in HoughTransform

- Use **GenFit interface** inside Tracker, retire simple Kalman completely

Vertexing Effort

(2) Multiple Collision Vertexing & Evaluation

(I) Generic Reconstruction Capability

- **RAVE interface** implementation as stand-alone Track=>Vertex SubsysReco

(II) Revisit Initial Vertexing Algorithm

- Modify the initial guessing to be parallel or iterative searches

(III) Revise Truth Storage

- Distinguishing collision and decay vertex storage

(IV) Update Evaluation to determine success rate on multiple vertexing

- low False Positive, low False Negative rates

(V) Replace vertexing code inside HoughTransform, retire old vertexing code

Projection Effort

(3) Advanced Track Projections

(I) Tool to run tracks through field & material

- **GenFit interface** expose propagater

(II) Fill Outer State Vector Storage

- SvtxTrack can store multiple projections, but doesn't yet

(III) Update Calorimeter Projection

- uses very simple helix projections from vertex, easily confused by scattering

(IV) Remove projection code on Tracking

Primary Track Effort

(4) Primary Vertex Tracking

(I) Fill the collision vertex covariance

- **RAVE interface** should do this when refitting the vertex

(II) Refit the tracks with the vertex & covariance

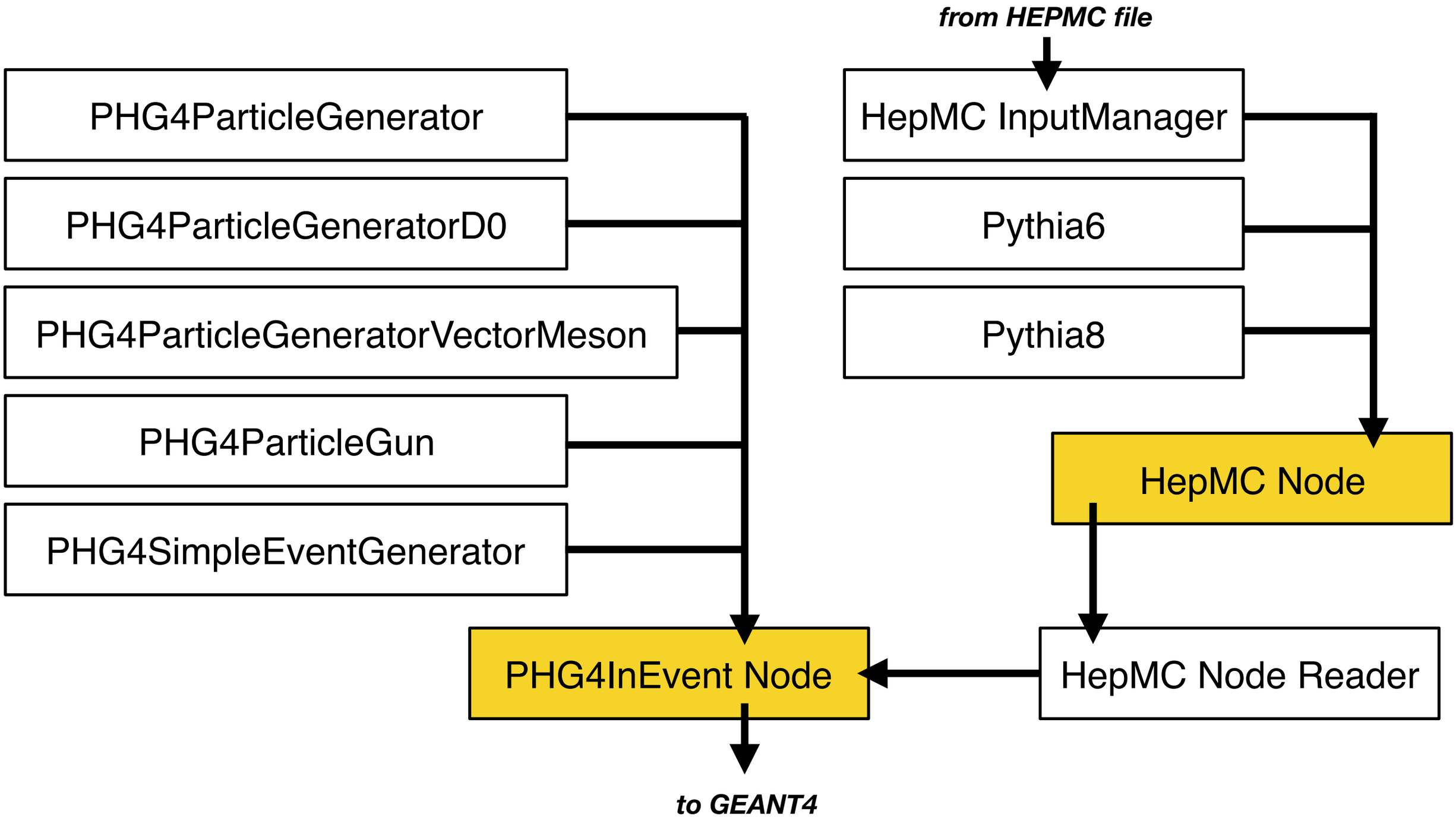
- **GenFit interface** can be used in a new SubsysReco
- reads SvtxTrackMap, outputs SvtxPrimaryTrackMap

Pileup Effort

(5) Pileup Simulations

(I) Add Time Dependence to g4main / g4detectors

(II) Revise Generator workflow

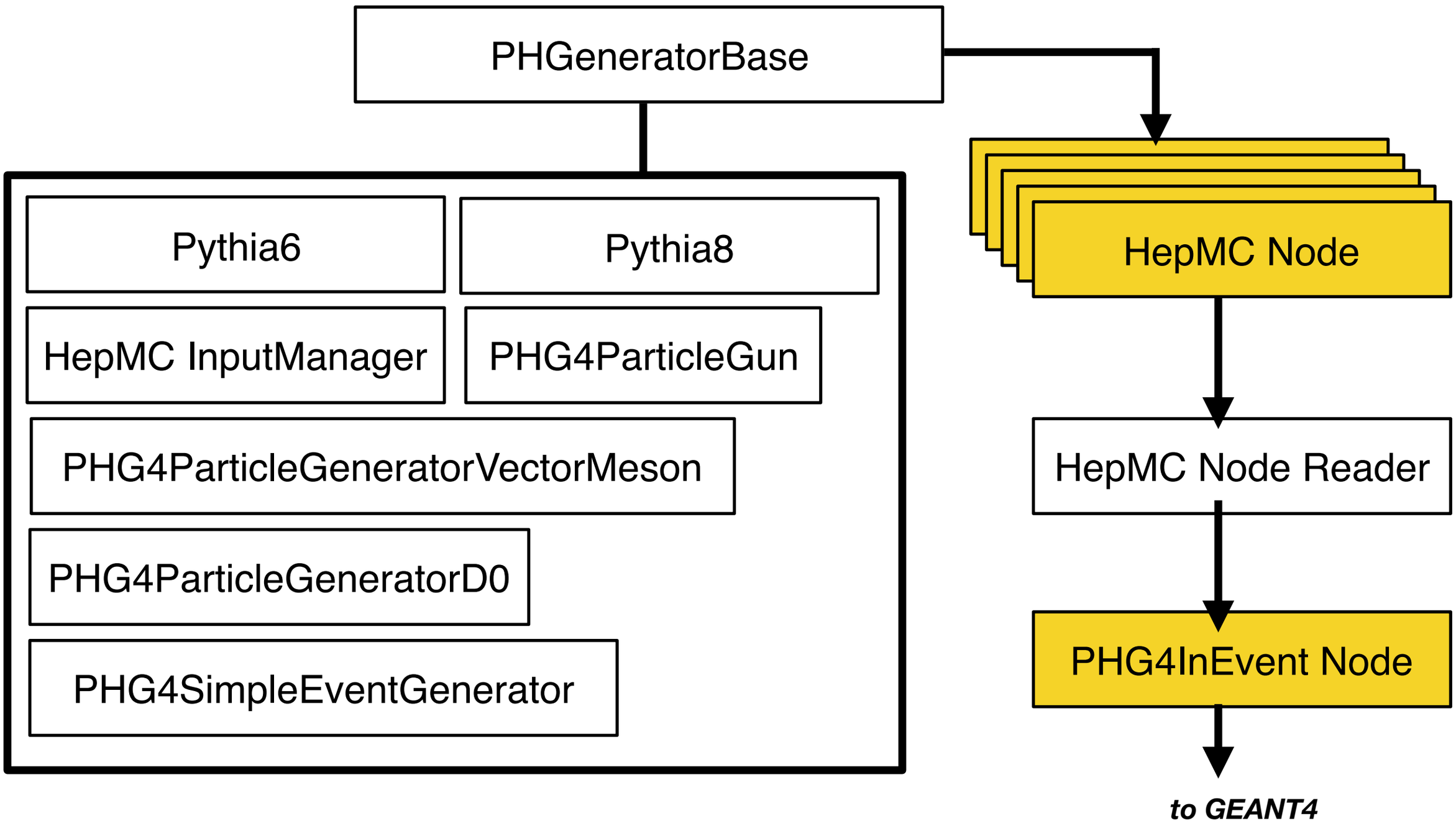


Pileup Effort II

(5) Pileup Simulations

(I) Add Time Dependence to g4main / g4detectors

(II) Revise Generator workflow

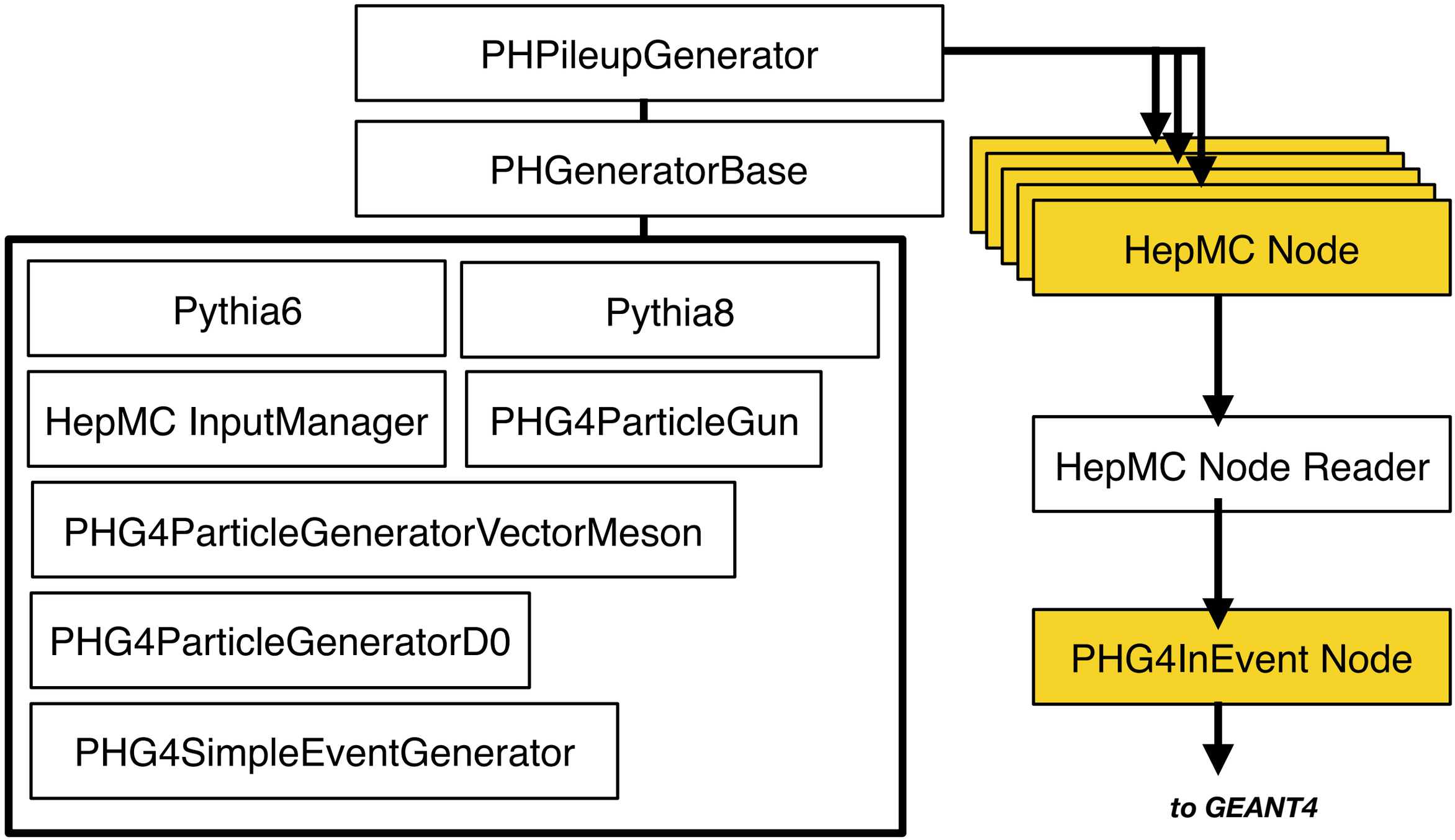


Pileup Effort III

(5) Pileup Simulations

(I) Add Time Dependence to g4main / g4detectors

(II) Revise Generator workflow



Pileup Effort IV

(5) Pileup Simulations

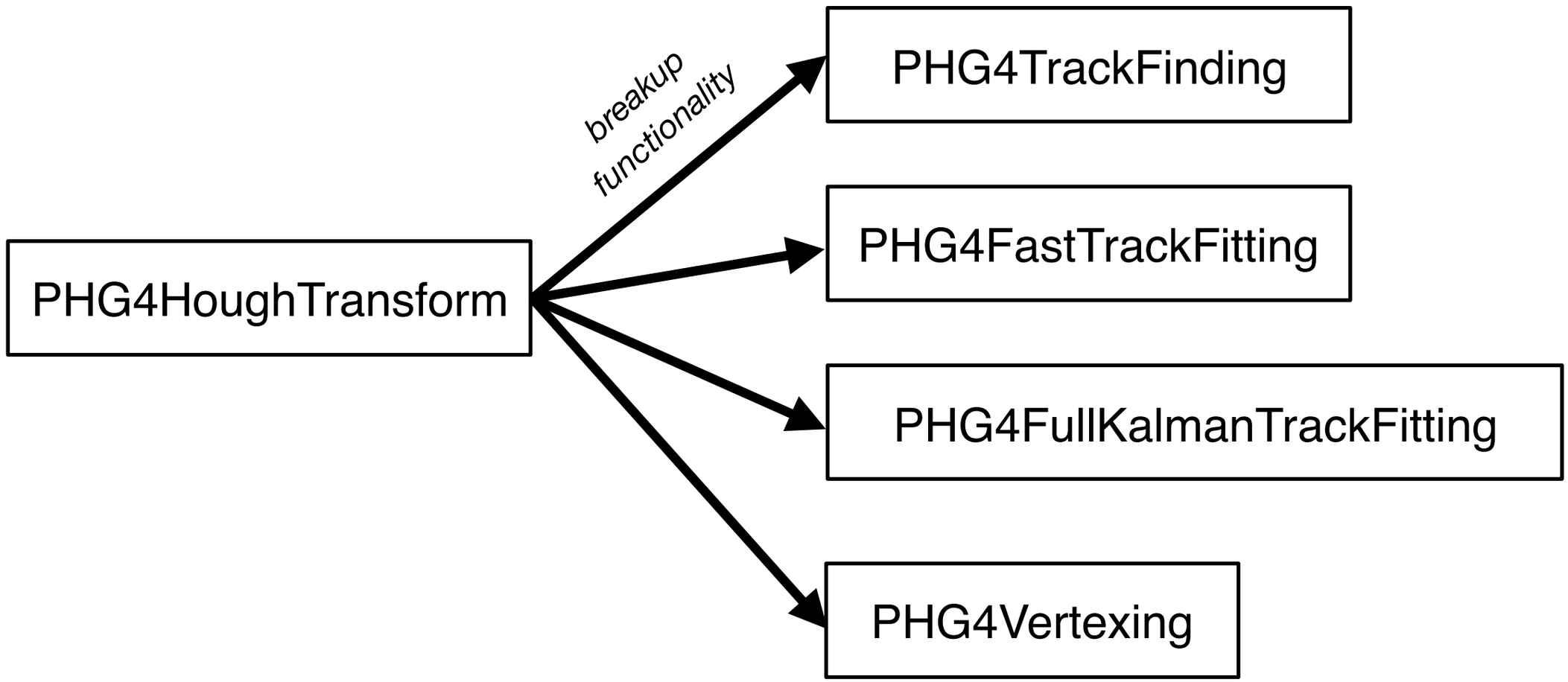
(I) Add Time Dependence to g4main / g4detectors

(II) Revise Generator workflow

(III) Requires Multiple Vertexing (**RAVE interface**)

Modularizing HoughTransform

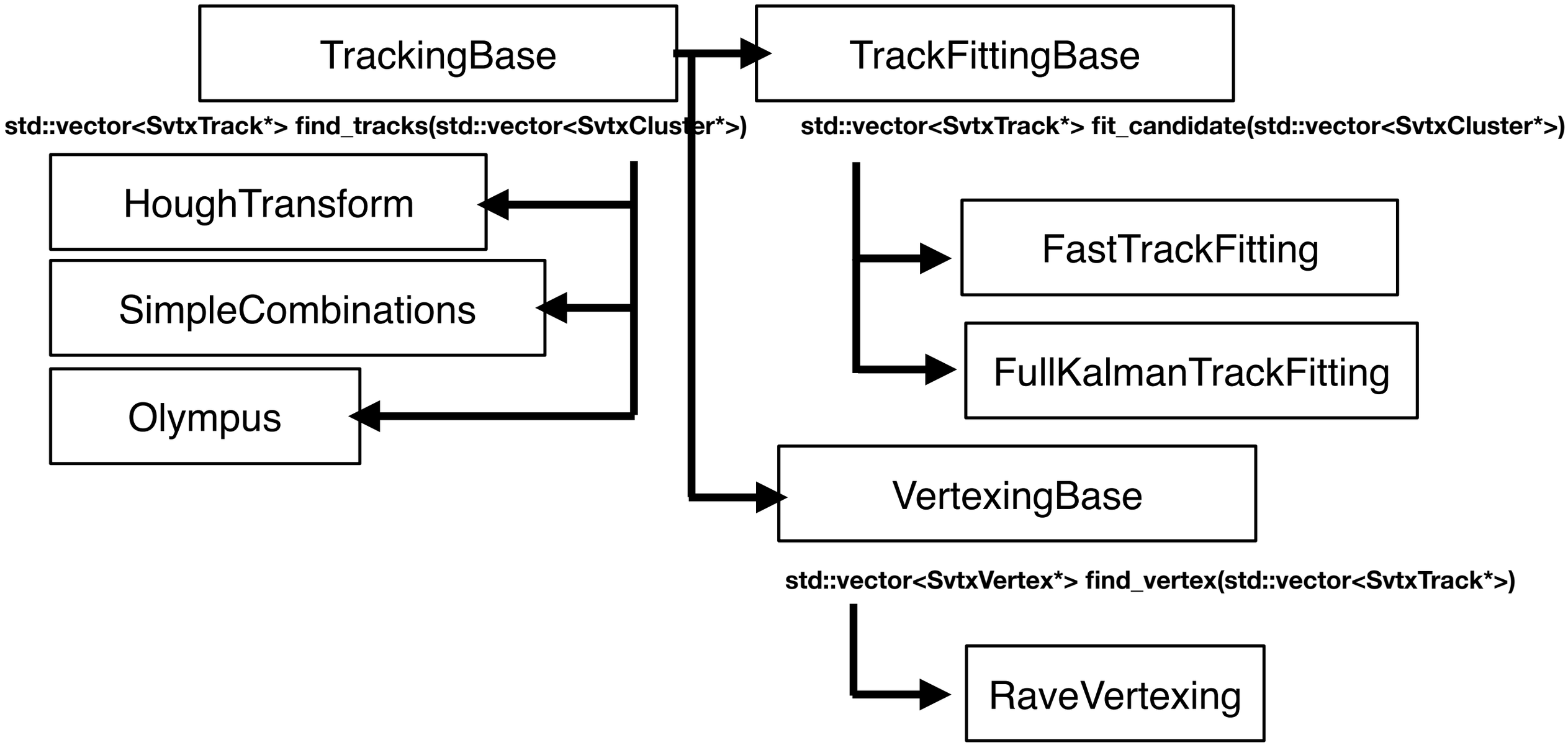
There are memory performance reasons to fit track candidates right after discovery, so a plan like the follow could have problems:



In storing *all* the candidates, then fitting them.

Modularizing HoughTransform

An Alternative Option is to have the finding provide candidates to other objects:



TrackingBase asks as a “candidate gun” calling a set of user determined functions on each candidate set using a user determined algorithm to produce the sets